

REMARKS

The Office Action of October 31, 2006, has been received and reviewed.

Claims 1-87 are currently pending and under consideration in the above-referenced application. Claims 18-87 have been withdrawn from consideration as being drawn to distinct species. Each of claims 1-17 stands rejected.

Reconsideration of the above-referenced application is respectfully requested.

Rejections under 35 U.S.C. § 103(a)

Claims 1-17 stand rejected under 35 U.S.C. § 103(a).

The standard for establishing and maintaining a rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Kikuchi in View of Yoshihara

Claims 1-9, 11, 16, and 17 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in U.S. Patent No. 6,278,153 to Kikuchi et al. (hereinafter "Kikuchi") in view of U.S. Patent No. 6,117,486 to Yoshihara (hereinafter "Yoshihara").

Kikuchi shows, in FIG. 6D, an intermediate semiconductor device structure in which a layer of resist 20 has been disposed within and over a via-hole 23a. Kikuchi also teaches that the resist 20 can be applied by several conventional methods, including spin-coating. Col. 17,

lines 63-66. While resist 20 appears to have a planar surface in FIG. 6D of Kikuchi, Kikuchi lacks any teaching or suggestion that the surface of resist 20 is planar.

Yoshihara teaches a method and an apparatus for forming a uniform resist film on a substrate. Col. 2, lines 31-34. Yoshihara teaches that by spinning a semiconductor wafer at high speeds (“as low as 2000 rpm”; col. 11, line 16), lowering the speed for a time, and increasing the speed, the wafer can be coated with material in such a way that the material layer has a substantially uniform thickness. The phrase “uniform thickness” should not be confused with a “substantially planar” upper surface.

Independent claim 1 is drawn to a method for disposing a material on a semiconductor device structure that includes providing a semiconductor device structure including a surface and at least one recess formed in the surface, disposing the material on at least a portion of the surface so as to substantially fill the at least one recess, the material covering the surface having a thickness less than a depth of the at least one recess without subsequently removing the material from the surface, an upper surface of the material being substantially planar.

As amended and presented herein, independent claim 1 recites that the material forms a layer with a non-uniform thickness.

It is respectfully submitted there are at least three reasons a *prima facie* case of obviousness has not been established against any of claims 1-9, 11, 16, and 17.

First, neither Kikuchi nor Yoshihara teach or suggest each and every element of independent claim 1. Specifically, the asserted combination of references does not teach or suggest that a material covering the surface and filling a recess in the semiconductor device has a non-uniform thickness. Moreover, the asserted combination of references does not teach or suggest that an upper surface of the material may be planar. Kikuchi teaches that layers of resist may be spin-coated onto semiconductor substrates that include recesses. As is well known in the art, conventional spin-coating processes result in resist layers which have substantially uniform thicknesses; a teaching which is not contradicted by Kikuchi. However, Kikuchi neither teaches nor suggests that resist layers so formed have substantially planar surfaces, at least over or within the recesses of such semiconductor substrates. Yoshihara teaches that by spinning a semiconductor wafer at high speeds (“as low as 2000 rpm”; col. 11, line 16), lowering the speed

for a time, and re-increasing the speed, the wafer can be coated with material in such a way that the material layer has a substantially *uniform thickness*. It is clearly not possible for a layer which has a substantially uniform thickness and which is formed over a nonplanar surface to have a planar surface. It is, therefore, respectfully submitted that Yoshihara does not supply the motivation, suggestion, or teaching missing from Kikuchi that the techniques described in Kikuchi or Yoshihara are useful for disposing material within recesses such that the upper surface of at least the material within or over the recesses has a substantially planar upper surface.

The Office asserts that the predetermined and uniform thickness of the resist film taught by Yoshihara is “analogous to substantially planar.” Office Action, page 4. However, a greater thickness of material must be deposited in recessed portions than in non-recessed portions to obtain a layer with a planar upper surface. If one were to deposit a uniformly thick resist layer such as that taught by Yoshihara on a substrate with recessed portions, the resulting structure would have a resist layer with an upper surface shaped identically to the upper surface of the substrate. In other words, depositing a uniformly thick layer of resist material on a substrate with recessed portions would result in a resist layer with depressed regions over the recessed portions. As such, the asserted combination of Kikuchi and Yoshihara does not teach or suggest depositing a layer of material with a planar upper surface on a structure with recesses.

In any event, a layer with a substantially uniform thickness cannot have a non-uniform thickness, as recited in amended independent claim 1.

Moreover, Kikuchi and Yoshihara do not teach or suggest that the resist layer 20 covering the surface has a thickness less than the depth of a recess 23a in the substrate. Rather, the description of Kikuchi is limited to figures showing a resist layer 20 that appears to be planar whereas the description of Yoshihara is limited to a resist layer with uniform thickness. It is respectfully submitted that Kikuchi, lacks any express description that the surface of resist 20 shown in FIGs. 6D, 10C or 13D is planar. A high standard has been set for reliance on drawings in prior art rejections. In view of the warning that has been provided by M.P.E.P. § 2125 with respect to reliance upon the drawings of a patent, and without further guidance from the specification of Kikuchi, the mere inclusion of a straight line to depict the surface of resist 20

does not adequately indicate that surfaces represented by the straight lines are substantially planar. Thus, the drawings of Kikuchi are merely simplified representations that cannot be relied upon to support the assertion that Kikuchi discloses a particular thickness of resist over a semiconductor device structure relative to the depth of a recess in the semiconductor device structure.

Second, one of skill in the art would not be motivated to combine the teachings of Kikuchi and Yoshihara to form a resist layer with a planar upper surface because neither Kikuchi nor Yoshihara teaches or suggests a semiconductor device structure with a planar upper surface. Assuming, *arguendo*, that the teachings of Kikuchi supported the assertion of a resist layer 20 with a substantially planar upper surface, Yoshihara, drawn to a method of forming a uniform surface by spin-coating, teaches away from the formation of the planar surface and, further, teaches away from the formation of a layer of non-uniform thickness. Thus, without the benefit of hindsight that the claims of the above-referenced application provide to the Office, one of skill in the art wouldn't have been motivated to combine the teachings of Kikuchi and Yoshihara to arrive at the invention of independent claim 1.

Third, one of skill in the art would have no reasonable expectation that the combining the teachings of Kikuchi with the teachings of Yoshihara could successfully form of a resist layer with a substantially planar upper surface on a semiconductor structure with recessed portions.

Thus, it is respectfully submitted that the asserted combination of teachings from Kikuchi and Yoshihara does not support a *prima facie* case of obviousness against any of claims 1-9, 11, 16, and 17 of the above-referenced application.

Claim 5 is further allowable as neither Kikuchi nor Yoshihara teaches or suggests initially spinning a semiconductor device structure at a rate of about 1,000 rpm. Instead, the initial spin rate taught by Yoshihara is "as low as 2000 rpm . . .," which is more than twice as high as the initial rate recited in claim 5. Col. 11, line 16.

Withdrawal of the 35 U.S.C. § 103(a) rejections of each of claims 1-9, 11, 16, and 17 is respectfully requested, as is the allowance of these claims.

Kikuchi and Yoshihara in View of Lin

Claim 10 stands rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in Kikuchi and Yoshihara, as applied above, and further in view of U.S. Patent No. 6,046,083 to Lin et al. (hereinafter "Lin").

It is respectfully submitted that claim 10 is allowable, among other reasons, from depending indirectly from claim 1, which is allowable.

It is respectfully requested that 35 U.S.C. § 103(a) rejection of claim 10 be withdrawn, and that this claim be allowed.

Kikuchi and Yoshihara in View of Park

Claims 12-15 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in Kikuchi and Yoshihara, as applied above, and further in view of U.S. Patent No. 6,326,282 to Park et al. (hereinafter "Park").

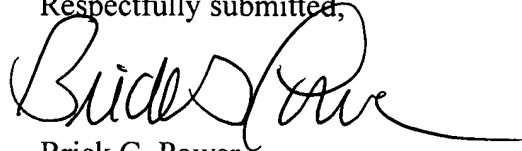
It is respectfully submitted that claims 12-15 are allowable, among other reasons, as depending either directly or indirectly from claim 1, which is allowable.

Withdrawal of the 35 U.S.C. § 103(a) rejections of each of claims 12-15 is respectfully requested, as is allowance of these claims.

CONCLUSION

It is respectfully submitted that each of claims 1-17 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Brick G. Power", with a long horizontal flourish extending to the right.

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